Compliments of
the Author

AUG 1901

OKLAHOMA AGRICULTURAL EXPERIMENT STATION,

STILLWATER, OKLAHOMA.

CIRCULAR OF INFORMATION, NO. 3.

DIRECTIONS FOR COLLECTING AND PRESERVING INSECTS AND PLANTS.

E. MEAD WILCOX, Ph. D. (Harvard.)

The following directions have been prepared for the purpose of placing in the hands of citizens of Oklahoma sufficient information to enable them to intelligently co-operate with the experiment station in its efforts to build up here a complete collection of the insects and plants of Oklahoma. It is hoped thereby so establish a corps of voluntary observers and collectors of our native flora and insect fauna with representatives in all parts of the territory. In this way the writer desires to encourage many persons to undertake, in their own locality, the more serious study of their common plants and insects. The combined efforts of all these persons will rapidly collect a thorough knowledge of the plants and insects of the whole territory and this valuable information may then be rendered available to all those interested through the medium of the experiment station.

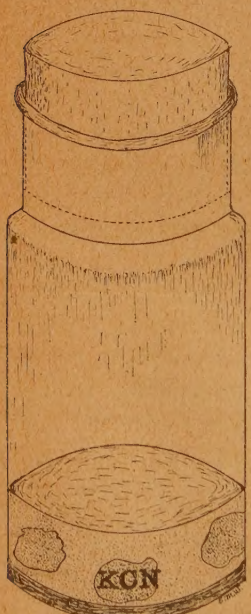
For this purpose the station desires specimens of each insect and plant from each of the counties of the territory—such a collection forms a very important part of the equipment of the station and enables it to better answer the numerous questions that continually come to it from all parts of the territory concerning weeds, forage plants, and troublesome insects. But further than this it is hoped that many farmers and others may be induced, as a natural result of undertaking these studies, to build up a collection of their own. Such a private collection, if carefully prepared, will enable the owner to identify most of the common plants and insects to which his attention may be called during the year. It cannot be doubted that such local

collections would prove of great value to the agricultural and horticultural interests of the region and at the same time afford a pleasant and profitable "hobby" to those engaged in such work.

All the figures for this bulletin were make by the author except figures 4 and 11. These were kindly loaned by the Kny-Scheerer Company of New York City and the Bausch and Lomb Optical Company of Rochester, N. Y., respectively. I desire to express here my thanks to these two firms for this kindness.

Collecting Insects.

The first thing required is a "cyanide" bottle (see figure 1) in which to kill the insects collected without injury to them. For this purpose select a wide-mouth bottle; one about five inches high and about two and one half inches in diameter is suitable for this use. In the bottom of the bottle place three or four pieces of potassium cyanide of sufficient size to cover the bottom of the bottle to an average depth of about a half inch. Then pour into the bottle enough thick paste of plaster of Paris to cover the pieces of potassium cyanide. To make this paste take a sufficient amount of water, depending upon the size of the bottle to be employed, and slowly add it to the plaster of Paris, constantly stirring, until a very thick paste is formed. Any druggist should be able to make such a bottle in a few minutes at a very trifling cost.



The cyanide bottle thus prepared should be allowed to stand open until the plaster of Paris is hardened and dry. After this the bottle should at all times be kept closed with a proper cork stopper to prevent the potassium cyanide from rapidly losing strength. Remember also that potassium cyanide is a very dangerous poison.

Collecting Net.

A collecting net is a necessity if one cares to capture any of the butterflies and moths or other rapid flying insects. This may either be purchased* or may be made at home by a person of ordinary ingenuity.

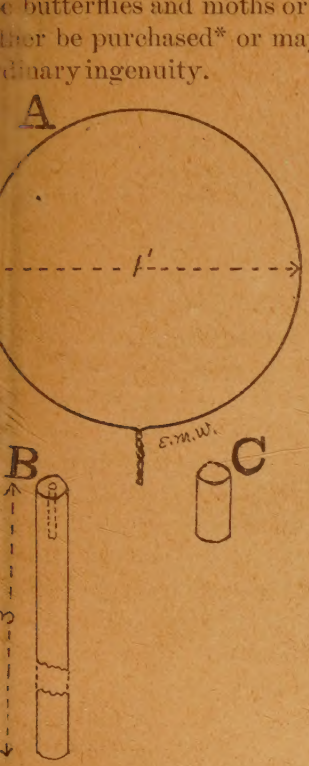


Figure 2.

To make the net, secure a round piece of strong but light wood about thirty-six inches long and about three fourths of an inch in diameter. In one end of this handle bore a hole about three inches long and about a quarter of an inch in diameter (figure 2, B). The frame is to be made from a strong piece of wire about three feet long. The wire is bent, as shown in figure 2A, to form a circle about one foot in diameter. The two free ends are then crossed and carefully twisted to form a screw as shown in the figure. This screw is then driven into the hole in the end of the handle and secured firmly in place by a suitable ferrule (figure 2, C).

The net itself should be made from either "bobinet" or "silk-oiling"—the latter is best but the former is cheaper and may be more readily secured in our local stores. Cheese cloth is frequently recommended for this purpose and indeed answers the purpose very well. The cloth should be cut as shown in figure 3 about two feet and four inches wide and three feet long. One edge is cut into four equal scallops as shown in the figure. This scalloped edge is sewn up as well as the side remaining and the net is then ready to be attached to the wire

*Insect nets and other apparatus for the collecting and preserving of insects may be secured from the Kny-Scheerer Company of New York City or other dealers in entomological supplies.

frame. There should be firmly attached directly to the wire binding of strong mus and to this the net its can then be fastened (s figure 4).

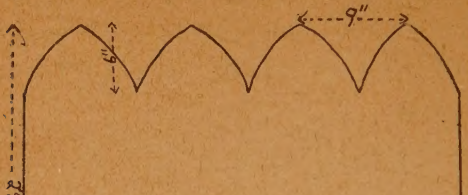


Figure 3.

A little practice w the net will enable o to approach and captu the most agile of insec The handle is held fir ly in one hand and m ed very rapidly towa the insect to be captu ed—as soon as the insect is within the net, turn the hand quickly and thus make the side of the net serve as a covering

Figure 4.

the opening to prevent the escape of the insect. The ins should be taken from the bottle as soon as it is dead to av breaking the specimen when new ones are placed in the bot to be killed.

Directions for Shipping Inseets Through the Mail.

If any of the insects gathered are to be sent to the expe ment station it is best to proceed as follows to insure that th arrive in good condition. Butterflies and moths are best plac in small paper pockets made by folding heavy manila paper

vn in figure 5. Only one insect should ever be placed in one hese pockets but several of the pockets with the enclosed in- s may be placed in an ordinary envelope and sent through mails with comparative safety.

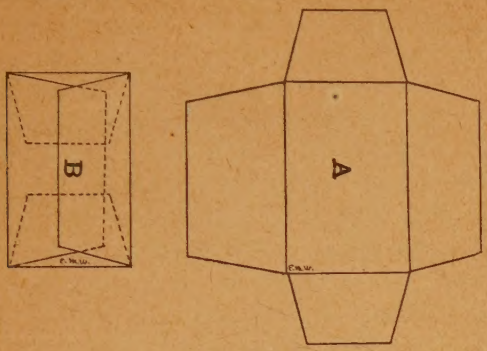


Figure 5.

All other insects may be sent to the station enclosed in a tin wooden box with enough cotton to prevent them from being ired by jarring in the mails. *Insects should never be for- rded through the mails enclosed in pasteboard boxes as they sure to be greatly injured and most likely entirely destroyed ransit.* Spiders and the larvae and "catterpillars" of insects best killed in alcohol or whiskey and may then be sent ough the mails if the bottle is carefully packed in cotton in a oden or tin box. The bottle should be filled to the stopper h the liquid as otherwise the jarring would be likely to in- e the specimen owing to the bubble of air enclosed.

Live insects may be sent to the station enclosed in tin or oden boxes if the precaution is always taken to enclose with insect enough of the foliage upon which it was found feed- to prevent the too great jarring of the contents of the box. not punch holes in the box in which live insects are sent.

If more than one insect is sent to the station at once it will necessary to have a number attached to each insect corres- nding to a number placed upon another specimen of the same ect retained by the collector at home. If this suggestion is

always carefully followed it will enable the entomologist to r fer readily to any insect previously sent to him by any perso by number and also will allow the collector to attach the corre name to his numbered specimen of the insect whenever th name of a certain number is sent to him. In the case of th butterflies and moths these numbers may best be attached to th paper pockets in which they are enclosed. Specimens in alc hol may best be numbered by means of a gummed label attache to the bottle. While in the case of bettles, true bugs, and ot er insects of this class it will be best to resort to this plan. E close a small piece of paper bearing the correct number wi the specimen or specimens of the insect in a piece of thin tiss paper and then these packages of insects may be enclosed in tin or wooden box and sent in safety.

Collectors are reminded that it is desirable to send sever specimens of each sort of insect collected—in fact in most cas it will be the best to send all of the specimens of the insect to found unless that number runs above twenty-five.

Preserving Insects in a Collection.

The following directions are prepared to enable the farm or other person interested in insects to form for himself a p vate collection of the interesting insects he has collected in neighborhood. I have already referred to the great advantag of every farmer having such a collection of insects as well plants for reference. In the first place it is necessary to give each insect as it is collected a number by which it is to be kno just as is a prisoner when he enters prison. A book should provided in which may be entered the following notes regardi each insect opposite the number assigned to it as it enters collection:—date of collecting, locality, relative abundance, ti of first appearance of the insect in the spring or summer, and pecially a complete record of all facts secured regarding feeding habits. It is thus possible to refer to this book at a time and ascertain complete information regarding any ins in the collection.

I have already indicated the best method of attaching these numbers to insects to be sent to the station and it yet remains to explain the proper method of attaching the numbers to insects to be placed in the collection.

Mounting Insects

Insects that are to be placed in the collection must be first properly "pinned". This consists in inserting a pin* vertically through the body of the insect. In the case of bettles the pin should, however, pass through the triangular piece between the bases of the outer wings. In other cases pass the pin through the central region of the body. And it is best to allow exactly one fourth the length of the pin to project above the insect. By thus having all the insects in the collection at the same level the general appearance of the collection is much improved.

To accomplish this object it is best to take a pinning block such as is shown in figure 6. The two pieces of board should be one fourth the length of the pin in thickness. The lower piece may well be two by one and one half inches and the upper one one by one and a half inches in size and if the No. 3 insect pin be used they will need to be three eighths of an inch in thickness. Holes large enough to admit the heads of the pins

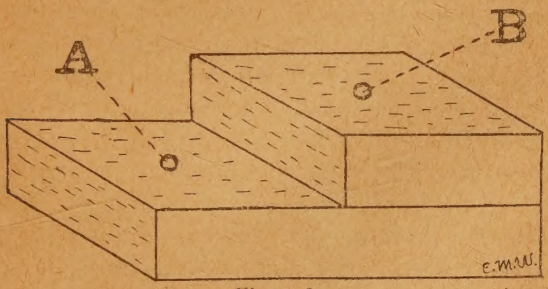


Figure 6.

used should be bored clear through the two steps thus formed, (figure 6, A and B.) The two pieces may be glued together or otherwise securely fastened.

Now pass a pin through the insect nearly up to head of the

*Ordinary pins may be used but the regular No. 3 black insect pins are much to be preferred. These may be secured at a small cost from any dealer in entomological supplies.

pin. Then invert the pin and place the head of the pin down in the hole on the lower step of the pinning block. Force the pin down until the head touches the bottom when the insect will be in proper position on the pin.

Butterflies and moths must have their wings stretched before they are placed in the collection. This is done as soon as the pin is thrust through them and before they have time to become too dry to be easlly stretched. The two pairs of wings are arranged and pinned down on a mounting block as shown in figure 7. They should remain here for several days or at least until perfectly dry and fixed in position. "Snake-feeders" and grass hoppers may also be mounted in this way in order to better show the character of the wings.

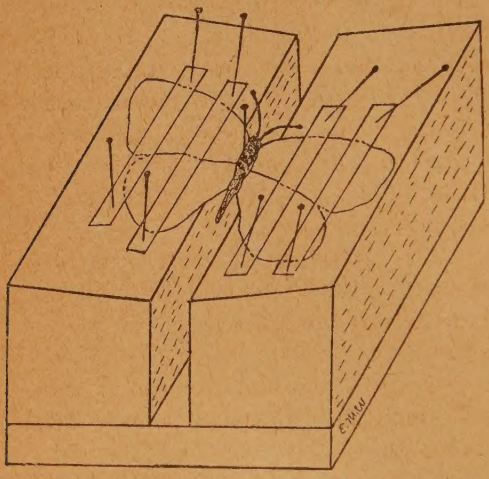


Figure 7.

The number of the insect should be written plainly on a piece of stiff white paper about three sixteenths by one half inch in size. This piece of paper bearing the number is placed directly over the hole on the upper step of the block and the pin with the insect on it, is thrust down through the paper until the point of the pin touches the bottom of the hole.

The insects may be stored in as elaborate cases as the collector cares to provide but the simplest is the ordinary cigar box. In the bottom of this fasten with a few tacks a piece of thin sheet cork large enough to cover the bottom of the box. The insects may then be pinned onto this sheet of cork as prepared and be readily examined without being injured. The attacks of

ice should be carefully guarded against and a moth ball should placed in each box to keep out insects that would soon des- the collection.

Just how the various insects are to be arranged in the boxes ends entirely upon the desires of the collector. A good plan to have a box devoted to insects found on each of the crops own by the farmer. For example, all the insects found upon heat may well be put in one box where they may be readily amined at any time.

Collecting Plants.

If it were possible to have living representatives of all the ants of the world before us at all times of the year it would ot be necessary to have a collection of the dry plants at hand r study and reference. But since this is manifestly impossible e herbarium, or collection, of the dry specimens representing e flora of any given locality, has come to be of the greatest portance to the botanist. And this importance is none the ss keen if the botanist confines his attention to a very small d restricted part of the territory about him.

The constant increase in the perfection and the widening in- uence of the means of intercommunication between the remot- t parts of the earth leads naturally to the introduction of many lants from one part of the earth into another region. Many f these introduced plants are of course some of our important ltivated plants, while not a small percentage of our worst eeds are also numbered among the introduced plants which ave found particularly favorable conditions in the new locality. is thus very important that the cultivator of any crop be well nformed concerning the two classes of introduced plants to hich I have now referred. The importance of this information further increased by the fact that many of the common native s well as introduced plants, all of which are frequently and cor- ectly referred to from the standpoint of the cultivator as weeds", serve as the breeding ground of fungus and insect ests. And hence it may arise that some one or more of these

must be destroyed for no other reason than that they are har boring some pest of this sort. And hence it is that I feel full warranted in urging the importance of the agriculturist an horticulturist becoming well acquainted with the plants of hi region. And this fund of information can only be secure through the systematic study of the plants themselves and th collection and formation of an herbarium of the plants of th immediate locality.

What Constitutes An Herbarium Specimen.

If the entire herbarium is designed to adequately represen the flora of any region then it is necessary that each specime in it fairly represent some species in that flora. In other word a typical herbarium specimen of any given species should ex hibit root, stem, leaves, flower, and fruit of the species. T secure such a collection it will be necessary to visit the localit at intervals during the season—the flowering plant should be se cured early in the year and the fruiting plant be gathered at later period.

In the case of trees and shrubs a specimen of the twig bearing flowers, leaves, and the fruit will be enough so show th essential characteristics of the species but many herbaceou plants allow of being transferred entire to the drying sheet t be described and whenever this is possible it should by all mean be done. In the case of many such plants the characteristi root or underground stem system is of the very greatest inte est and value. In some cases judicious bending will enable person to place the entire plant on the sheet. This is particula ly the case with the grasses and allied plants.

With each plant should be placed a label, of about the sam size as shown in figure 8, on which should be written the follow ing data:—

1.—Name of the plant,
2.—Date on which collected,
3.—Locality,
4.—Name of the collector.

These data are best arranged on the label as shown in figure 8. It is common to place under "locality", simply the nearest post office address of the region but this is seldom enough information to preserve regarding each plant. For it is perfectly evident that plants from the most different soils and local conditions would in that way be given as coming simply from one "locality". It is much better to insert some catch word to indicate in general the character of the particular region in which the plant was found growing. For example one should write on the label "open prairies", "woods", "cultivated ground", or "river banks", etc. The collector will be interested to note that in general each of these special localities has a group of plants peculiar to itself and determined largely by the special conditions of moisture, etc, there prevailing.

Herbarium Oklahoma Agricultural
EXPERIMENT STATION.

Sitilias grandiflora (Nutt.) Greene.

Stillwater, Okla.

"Open Prairies".

Coll. E. Mead Wilcox. 4 May 1901.

Figure 8.

Whenever plants are to be sent to the experiment station each sort should have attached to it securely a small label bearing a number corresponding with a number attached to another specimen of the sort retained by the collector. This enables the botanist to refer to the plants by number when he sends out names of a package of plants while the collector may easily attach these names to the proper plants by simply noticing the the numbers attached to each plant.

Drying Plants.

For the purpose of thoroughly drying the plants to be placed in an herbarium there is needed some "driers" and a "press".

The driers can easily be made from any good absorbent paper by cutting it down to about twelve by eighteen inches. The cheapest and at the same time the best paper to use for this work is the so-called felt paper such as is frequently used under carpets. Ordinary white blotting paper is very good but is of course very expensive compared with the common felt paper mentioned.

The press can also be readily made at home in a short time and at little expense. Figure 9 shows clearly the method of construction of one half of such a press. Two parts are to be

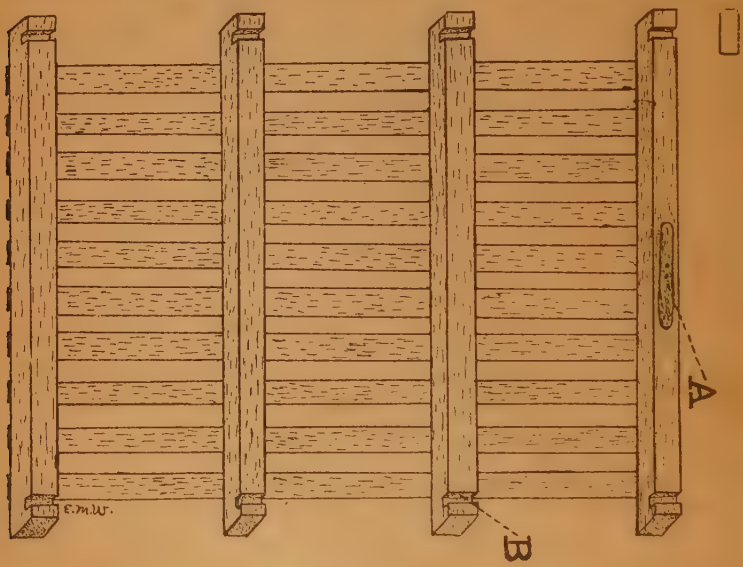


Figure 9.

made similar to the one shown in the figure. The four cross pieces should be of strong wood and three fourths by three fourths by fourteen inches. The ten longitudinal slats nailed to these are made of soft pine, poplar, or other soft wood and should be one eighth by three fourths by eighteen inches. Each of the four cross pieces should be provided with a notch on the projecting portion which is to fit the cord by which the

press is tied. On the end of one of these two parts of the press should be attached a piece of spring metal or flexible wood to serve as a binding screw to hold the free ends of the two strings used to fasten the press when in use. A strong cord is is to be fastened to each end of the cross piece at the oppoisite end of the same part that bears the binding screw.

Now it remains to explain the proper method of placing the plants in this press between the driers. The plants should be placed in the press before they have had an opportunity to wilt very much as otherwise the process is more difficult and it is probable that poor specimens will result. Place the part of the press without the binding screw on the table before you and on it place the driers. The first plant is now to be placed on this sheet and all the leaves carefully straightened with the hand so that they lie flatly on the paper. At least one of the leaves should be so placed as to show the lower surface of the leaf as it is frequently desirable to have the lower surface of the leaves for examination. Flowers should be so arranged as to show to the best advantage all their parts. When the plant is properly arranged cover it carefully with another drier, carefully passing the hand over this second drier to make sure that the first plant retains the position given it. Proceed in this fashion to put all the plants in the press and cover the last one with one of the driers.

Then place on this drier the other part of the press. By means of the cord the two parts can be made to press together upon the enclosed plants and driers with any desired pressure. The cord is to be passed around the ends of the cross pieces and the free ends are to be fastened over the binding screw at the end of the press.

At intervals of about twenty-four hours the moist driers in the press are to be removed and dry ones substituted for them. The moist ones will soon be dry and ready for use if placed out in the sun for a few minutes.

Preserving The Herbarium.

When the plants are perfectly dry they are to be removed and may then be placed between pieces of newspaper or other paper cut to the size of eleven and a half by sixteen and three fourths inches. This is the standard size used by most botanists and should be adopted by the private collector as a rule. These sheets with the plants on them would be arranged by botanists in groups in special covers called "genus covers" but perhaps for the private collection some other arrangement will be the most desirable. Care must be taken to prevent the ravages of mice and insects—the latter can best be prevented by exposing the collection of plants to the vapors of carbon bisulfid in a closed box at intervals of six months or a year.

If one is especially interested in the subject he may care to mount his plants on good paper in accordance with the practice of botanists. Paper for this work should be very good ledger and should be cut to eleven and one half by sixteen and three fourth inches. The plant to be mounted is first covered evenly on every part with glue (LePage's liquid glue is the best) and is then carefully lowered over the sheet taking care to leave room at the lower right hand corner to attach the label. Experience will show how much glue to use in each case and will enable the collector to make his collection more attractive and more valuable.

Flora of Oklahoma.

It is the desire of the botanical department of the experiment station to rapidly collect specimens of each plant found in each county of the territory. A good beginning has already been made in this work and Bulletin 45 presents the first attempt at a list of the flowering plants of Oklahoma. Our collection of the rusts, smuts, and other fungi of the territory is as yet very small and additions along this line are very much desired. When any of these fungi are found on leaves or stems the plant on which they are found is to be pressed as explained above. Specimens of toadstools and other larger fungi are

adily sent to the station packed in cotton moistened with wat-
. in wooden boxes.

The station now has its collection indexed on regular index
is each bearing a small map of Oklahoma and Indian Terri-
es (see figure 10). By means of a cross made in any county
e indicate in this index that we have a specimen of that partic-
ar species from that county in our collection. So far these
osses are largely confined to the central counties of the terri-
ry but I hope that many persons in many parts of the territory
ill volunteer to assist in making this collection complete and
ence enable the station to better serve their needs.

Figure 10.

A good pocket lens is a desirable article in carrying on the
rt of work indicated in this paper. No better lens for this
rpose can be secured than the one figured in figure 11. This
and other apparatus for the study and collection of plants can be secured from the Cambridge Botanical Supply Company, Cambridge, Mass., or the Bausch and Lomb

Figure 11.

ptical Company of Rochester, New York.